KNOWLEDGE ORGANISER

YEAR 9 – TERM 4

THOMAS HALL SCHOOL

Think Like An
Environmentalist

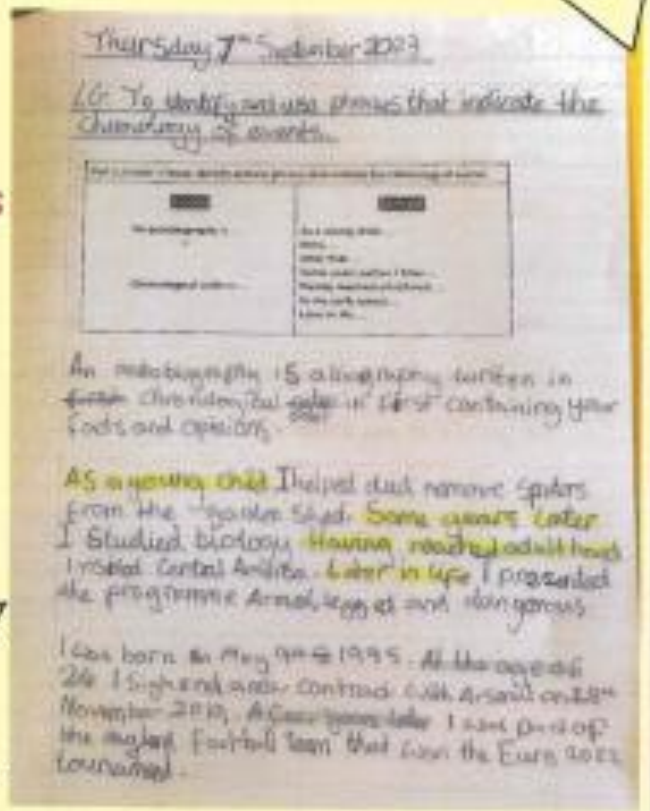
Community, Collaboration and Challenge

Long date and learning goal (LG) on left and underlined.

Minimise errors

Use pencil or blue or black pen for all written work, ruler for straight lines.

Worksheets glued in straight, next to margin.


Thursday 7th September 2017

LO: To identify and use phrases that indicate the chronology of events.

An autobiography is a biography written in chronological order in first person using past tense verbs and opinions.

As a young child I helped dad remove spiders from the garden shed. Some years later I studied biology. Having reached adulthood I visited Central America. Later in life I preceded the programme Armed, Legal and Dangerous.

I was born on May 9th 1995. At the age of 24 I signed a new contract with Arsenal on 28th November 2019. A few years later I was part of the England Football team that won the Euro 2021 tournament.


Music notes:

Numbered questions written in margin.

Always try your best to be neat (even when note taking).

Feel proud

Prepare for the future

Respond to feedback in green pen.

Easier to read and give better feedback

Single line through mistake. No scribbles.

ATTENDANCE MATTERS

EVERY DAY COUNTS
Missing just 1 day every 2 weeks is the same as missing 10% of the school year.

LEARNING
Being in school allows you the best opportunity to learn.

WELLBEING
Attending school supports your mental and emotional health.

FUTURE SUCCESS
Regular attendonce at school is vitol for building the key skills needed for future employment

EQUIPMENT

SCHOOL DAY

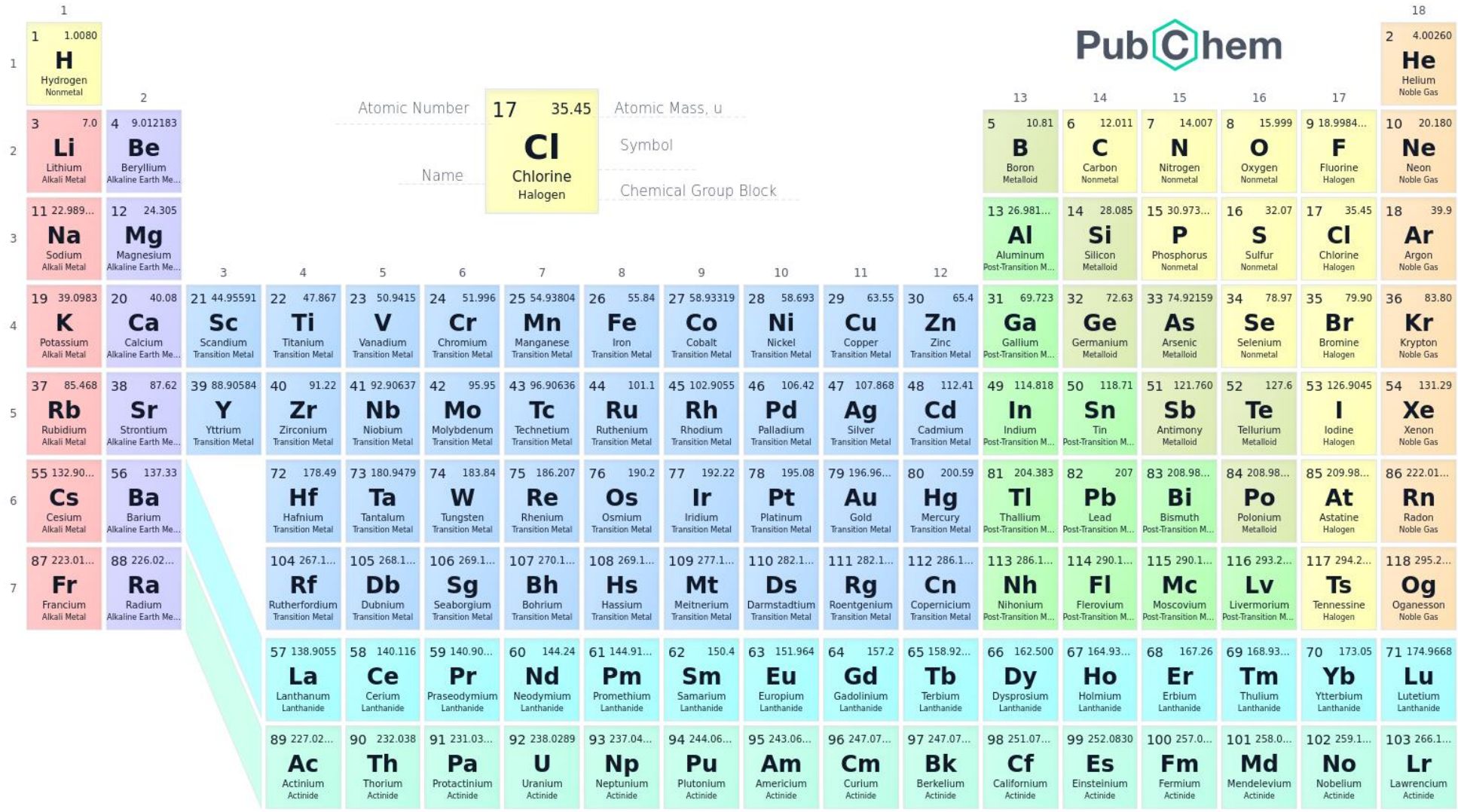
9:00–9:05	AM Reg
9:05–10:20	Lesson 1
10:20–11:35	Lesson 2
11:35–12:05	Break 1
12:05–13:20	Lesson 3
13:20–13:50	Break 2
13:50–15:05	Lesson 4
15:05–15:30	PM Reg – assembly or guided reading

Multiplication Grid

×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

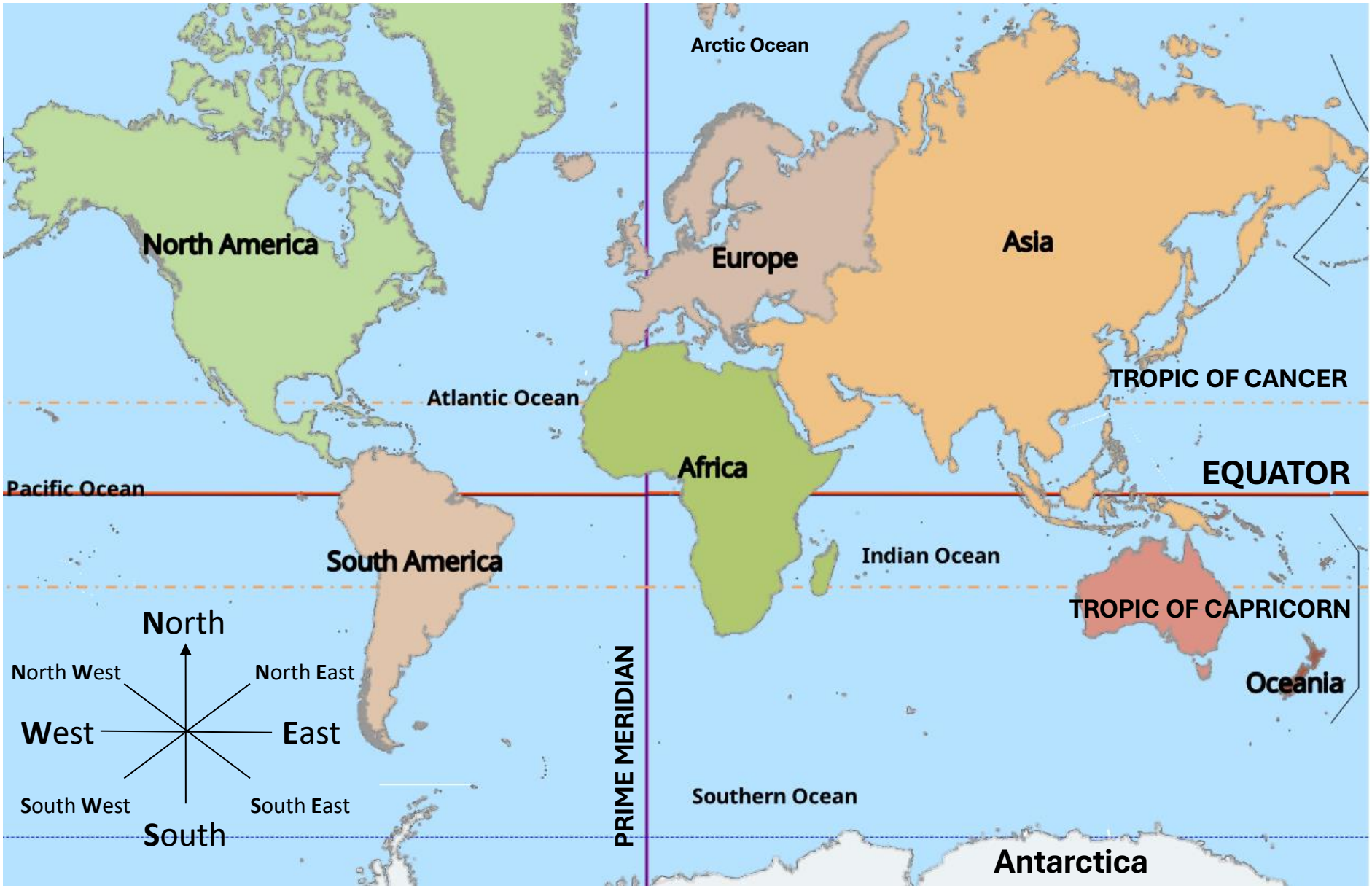
PERIODIC TABLE OF ELEMENTS

Chemical Group Block




01 Adjectives
THAT DESCRIBE:
age: young, old
colour: red, blue
condition: new, used
size: large, medium
speed: fast, slow
etc.
COMPARATIVE:
smaller, better...
SUPERLATIVE:
the smallest,
the worst,
the best...
02 Adverbs
PLACE:
here, there,
outside, everywhere,
upstairs, nowhere,
somewhere....
TIME:
ago, before, since,
yet, for, still,
afterwards...
FREQUENCY:
often, never,
sometimes, always
MANNER:
just, quite,
quickly, hardly,
well, carefully,
barely, almost,
scarcely,
beautifully...
03 Conjunctions
COORDINATING:
and, or, but,
yet, nor, for, so
CORRELATIVE:
both... and...,
either... or...,
just as... so...,
whether... or...,
neither... nor...,
not only... but also...
SUBORDINATING:
after, since, if,
while, although,
before, because,
unless
04 Determiners
TELLS US WHICH:
each, every,
some, none,
all...
TELLS US WHOSE:
my, your, her, his, its,
our, your, their (= possessive
adjectives or determiners)
05 Nouns
COMMON NOUNS: house, dog, laptop...
PROPER NOUNS:
(Capitalised)
London, Paris,
James, William,
Julia, Jennifer...
> VERBAL:
swimming...
> COLLECTIVE:
choir, jury...
> COMPOUND:
mother-in-law...
> COUNTABLE:
book, day...
> UNCOUNTABLE:
traffic, calm...
> ABSTRACT V. CONCRETE:
wit vs. road...
06 Prepositions
PLACE / DIRECTION:
in, at, on,
under, above,
across,
among,
between...
TIME:
in, at, on,
over, until, about,
during, before,
after, while,
through...
OTHER (agent,
phrase...):
by, with, on, over,
to, up, within,
beyond, for...
07 Pronouns
PERSONAL
(subject):
I, you, he, she, it,
we,
you, they
PERSONAL
(reflexive):
myself, yourself,
himself, herself,
itself, ourselves,
yourselves,
themselves
DEMONSTRATIVE:
this, these,
that, those
PERSONAL
(object):
me, you, him, her,
it, us, you, them
POSSESSIVE:
mine, yours, his,
hers, its, ours,
yours, theirs
INTERROGATIVE:
how, where,
when, which...?
INDEFINITE:
somebody,
anyone...
RELATIVE:
that, which,
whose, whom...
08 Verbs
ACTION:
to run, to organise,
to read, to think...
> Transitive
or
> Intransitive
LINKING:
to be,
to look, to appear,
to seem, to smell...
HELPING
(= AUXILIARY):
can, may,
will, must,
should, to be,
to have...
Word Classes

World Map


Arctic Ocean
North America
Europe
Asia
Atlantic Ocean
TROPIC OF CANCER
Africa
EQUATOR
Pacific Ocean
South America
Indian Ocean
TROPIC OF CAPRICORN
Oceania
North
North West
North East
West
East
South West
South East
South
PRIME MERIDIAN
Southern Ocean
Antarctica

Art

Year 9 Hockney Portraits Art Term 4

Introduction to David Hockney

- **Objective**: Understand who David Hockney is and explore his contribution to modern portraiture.
- **Activities**:
  - Presentation on Hockney's life and key artworks.
  - Class discussion: What makes his portraits unique?
  - Sketchbook activity: Annotate and respond to one Hockney portrait.



Style Analysis

- **Objective**: Identify and analyze key features of Hockney's portrait style.
- **Activities**:
  - Examine composition, color, pattern, and perspective in Hockney's work.
  - Colour pencil/paint response studies in sketchbook.



Drawing Facial Features

- **Objective**: Practice drawing realistic facial features.
- **Activities**:
- Guided drawing exercises (eyes, nose, mouth, ears).
- Compare realistic drawing to Hockney's stylized approach.
- Sketchbook work: Combine a realistic eye with Hockney-style background.
- Practice drawing a full face from a reference image.

Compositional Planning

- **Objective**: Design a portrait composition inspired by Hockney's style.
- **Activities**:
- Create thumbnail sketches exploring color, shape, and layout.
- Experiment with simplified backgrounds and strong lines.
- Annotate decisions in sketchbooks.
- Finish chosen thumbnail in color.



Color Theory + Media Exploration

- **Objective**: Explore Hockney's use of color and media.
- **Activities**:
- Media tests: watercolour, colored pencils, iPad drawing (if available).
- Recreate a section of a Hockney portrait in chosen media.
- **Homework**: Write a reflection on preferred media and why.

Begin Final Piece

- **Objective**: Start the final Hockney-inspired portrait.
- **Activities**:
- Draw outline using reference photo and chosen style.
- Begin applying color and line work.
- Peer feedback sessions.
- Final touches and class display.
- Self and peer assessment using success criteria.

Computing

The Binary Number System

In the number system that us humans use, the number 10 means 'ten' because the digits mean '1 ten and 0 ones'.
…the number 33 means 'thirty three' because the digits mean '3 tens and 3 ones'.
…the number 528 means 'five hundred and twenty eight' because the digits mean '5 hundreds, 2 tens and 8 ones'.

10's	1's
1	0

10's	1's
3	3

100's	10's	1's
5	2	8

Humans developed this 'base 10' number system millions of years ago because they learnt to count using their hands, which have 10 digits.
Computers, being electronic, are simply made up of switches (which can be in only one of two states (on/off)) and as a result cannot count like us! As a result, computers use a different number system – the binary number system

2's	1's
1	0

8's	4's	2's	1's
1	0	0	1

The columns in the binary system, from right to left are 1, 2, 4, doubling as we go
…in binary the digits 10 means 'the number two' because the digits mean '1 two and 0 ones'.
…the digits 1001 means 'the number nine' because the digits mean '1 eight, 0 fours, 0 twos and 1 one'.

Converting from Binary to Decimal/Denary

To convert a binary number into decimal/denary, the process is thankfully really easy! All we need to do is add up the column values which contain a one and ignore the column values which contain a zero.
For example, the following binary number has the decimal/denary value of 155. This is because the 1s in the binary number represents **128 + 16 + 8 + 2 + 1 = 155**

128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	1

➔ **155**

Converting from Decimal/Denary to Binary

Converting from decimal/denary to binary, is also not too hard! We just need to work out which of the column values add together to form the decimal value that we needed to convert.
The easiest way is to do this is work from left to right along the binary column values and if the column value can fit into our decimal number, we place a 1 under that value's column, subtract the column value from the decimal number and continue the process. For example, if we want to convert the decimal number 202 into binary, we would do the following:

Does 128 fit into 202? Yes! So, we add a 1 to the column and subtract 128 from 202 leaving 74

128	64	32	16	8	4	2	1
1							

Does 64 fit into 74? Yes! So, we add a 1 to the column and subtract 64 from 74 leaving 10

128	64	32	16	8	4	2	1
1	1						

Does 32 fit into 10? No! So, we add a 0 to the column and move on!

128	64	32	16	8	4	2	1
1	1	0					

This process continues until we've made the remaining value of ten by placing 1s under the 8 and 2 columns (because 8 + 2 = 10), and zeros under the others.

128	64	32	16	8	4	2	1
1	1	0	0	1	0	1	0

Key Vocabulary

Key Word	*Definition*
Denary / Decimal	Base 10 number system - The number system we learnt in primary school
Binary	Base two number system – the only number system computers know – they can only understand two digits because they are made up of switches that can only be in the on (1) and off (0) state.
ASCII	Universally *accepted* binary numbers for each keyboard character
Bitmap	A computer image file which is made up of tiny pixels of colour. Each pixel is represented by a set of binary bits and mapped to the screen
Sampling	Recording analogue sound at regular intervals and converting each snippet of sound to a binary value.
Digital Processing	Applying maths on the binary which represents sound in order to manipulate how it sounds.

Binary Addition

Adding binary numbers is much like adding denary numbers (the system we use as humans).

Things to remember:

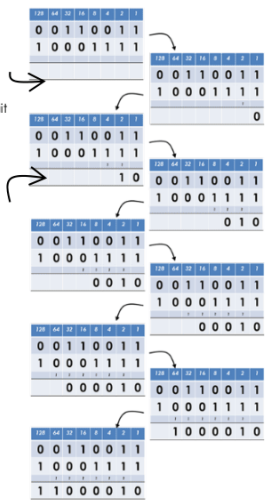
- ➔ Keep your numbers in the correct columns
- ➔ 1+1 = 10 in binary
- ➔ 1+1+1 = 11 in binary

We begin, like we would normally when adding two numbers together, with the right most column.

In this example, we add two 1s together, which of course is 2! However, in binary, 2 is represented as 10, and as there are two digits in this answer, we place the right digit (zero) under the column and carry the left digit (one) over to the next (left) column.

Now we focus on the second column from the right. Here we have 1+1+1 (including the carry), which of course equals 3. But in binary 3 is represented as 11. We therefore place the right digit underneath and carry the left digit.

This process then continues, moving through the columns to the left, until we have added the binary numbers.

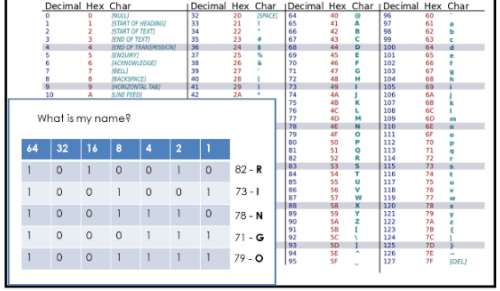


Representing Characters

- As we know, computers can only deal with 0s and 1s (binary).
- All data that it needs to work with (numbers, sound, images etc) must be converted into binary for the computer to be able to process it.
- It is exactly the same for text, or one piece of text known as a character.
- Each time you hit a key on a keyboard, the computer generates a code for that letter, which is then processed by the CPU and the result might be the letter appearing on the screen or being printed on paper.
- So that all computer systems behave in a similar way it is important that there is an agreed set of codes for characters.
- The agreed set of codes to represent the main characters in the English language is known as ASCII (American Standard Code for Information Interchange).

Below, you can see that each character is represented by a number. The binary table contains 5 binary numbers, and by working out the value of each binary number, we can see which letter it represents by looking it up in the ASCII table.

ASCII TABLE



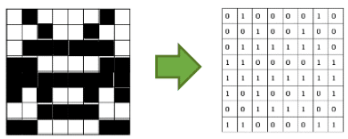
What is my name?

64	32	16	8	4	2	1	
1	0	1	0	0	1	0	82 - R
1	0	0	1	0	0	1	73 - I
1	0	0	1	1	1	0	78 - N
1	0	0	0	1	1	1	71 - G
1	0	0	1	1	1	1	79 - O

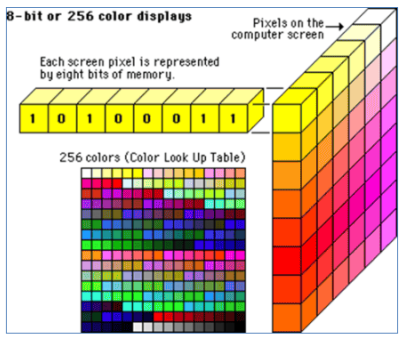
Representing Images

Bitmaps

Bitmap images are made up of rows of "dots" called "pixels" (picture elements). Each pixel is represented by a binary number. Behind the scenes, this 1-bit image (with each shade represented by a bit) is in fact a series of numbers:



In a coloured bitmap, longer binary numbers represent a different colour:



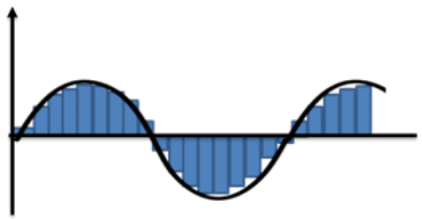
As images get more colourful, longer binary numbers are needed so that a bigger combination of colours can be shown.

Representing Sound

Analogue sounds (sound waves that continuously vary) are pure and of perfect quality.
However, computer recorded sound is not pure, not real and not of perfect quality and this is because sound has been digitised – it has been sampled at set intervals.

Sampling

Sampling is the process by which computers digitise sound.
They measure the height of sound waves at regular intervals and record the measurement as a binary number.
So, whereas analogue sound is continuous over time, digitised sound is made up of lots of 'sound bites' over time.



When computers play sound through a speaker, they process each of the binary measurements and send signals to the speaker making it vibrate in different ways, according to the binary data.

Drama

Year 9

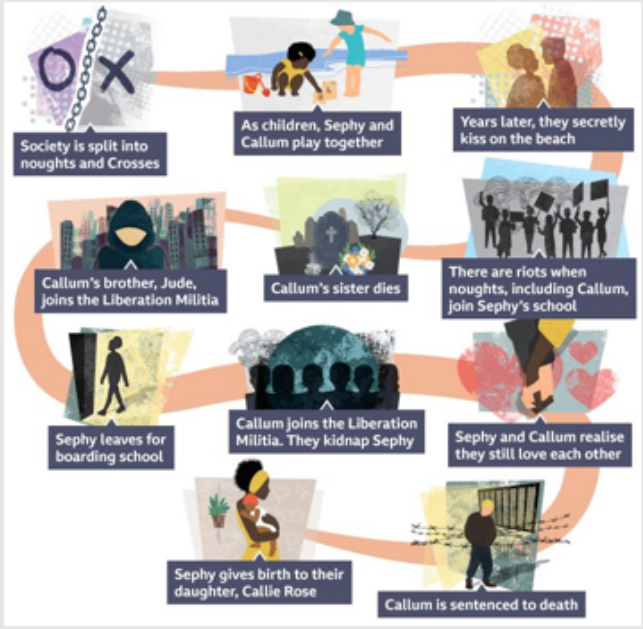
Drama

Term 4

Plot

Noughts & Crosses tells the story of Sephy and Callum, two young people from different races who fall in love and face prejudice, terrorism, and injustice.

The play takes place in a world similar to our own, but with a large divide between the ruling class, the Crosses, and the underclass, the noughts. The Crosses are dark-skinned and privileged, while the noughts are light-skinned and poor.



Terminology

Proxemics - the deliberate use of space, distance, and positioning between actors on stage to communicate unspoken information about their relationships, status, emotions, and the situation to the audience.
Semiotics - the study of how signs and symbols create meaning in theatre and performance.
Conscience Alley - a character facing a dilemma walks down an "alley" formed by two lines of people, who present opposing viewpoints (e.g., "do it" vs. "don't do it") to influence their decision.

Characters

Sephy - a privileged, dark-skinned Cross.
Callum - a poor, light-skinned Nought.
Kamal - a powerful, wealthy politician and Sephy's father.
Jasmine - Sephy's mother
Minerva - Sephy's sister
Meggie - Callum's mother
Ryan - Callum's father
Jude - Callum's brother
Lynette - Callum's sister
Mr Corsa - Headmaster at Heathcroft School
Shania - a Nought girl who attends Heathcroft School

English

'Hitcher,' by Simon Armitage

The poem is narrated by a speaker who describes picking up a hitchhiker and then violently attacking him. The speaker is under pressure at work and feels disconnected from his own life. The hitchhiker, on the other hadn, represents freedom and a carefree existence, which the speaker envies and resents.

Themes

1.Violence and Aggression: The poem vividly depicts an act of unprovoked violence, highlighting the speaker's pent-up anger and frustration2 . 2.Freedom vs. Conformity: The hitchhiker symbolizes a free-spirited lifestyle, in stark contrast to the speaker's mundane and pressured existence. 3. Alienation and Disconnection: The speaker feels alienated from his own life and disconnected from societal norms, which drives his violent behavior1.

'Half-Caste,' by John Agard

Dramatic and sarcastic, this monologue poem attacks the derogatory term for mixed-race individuals. Using Caribbean Creole, the poet challenges the notion of being 'half' a person, using analogies like Picasso's art and Tchaikovsky's symphony to argue that blending is a complex, artistic, and whole experience.

'Havisham,' by Carol Ann Duffy

This poem is a dramatic monologue exploring the corrosive nature of love turning to hate through the voice of Charles Dickens' *Great Expectations* character, Miss Havisham. The speaker, a jilted bride, expresses intense, violent rage and enduring bitterness while sittig in her decaying wedding dress.

- **Perspective:** Written in the first person, giving voice to a scorned woman.
- **Themes:** Explores themes of heartbreak, misogyny, insanity, and the destructive, all-consuming nature of revenge.
- **Imagery:** Uses morbid imagery to show the merging of love and hate, such as "beloved sweetheart bastard" and "dark green pebbles for eyes".
- **Structure:** The poem breaks down logical thought, reflecting the character's fragmented, chaotic mental state, and obsession with the past.

Wilfred Owen's 'Anthem for Doomed Youth' is a powerful WWI poem mourning young soldiers lost in battle, ironically contrasting the harsh reality of trench warfare with traditional, inadequate funeral rites, suggesting that the sounds of guns replace church bells and the pallor of grieving loved ones serves as the only "pall" for fragmented bodies, highlighting the brutal, dehumanizing nature of war. The poem serves as a bitter commentary on the disconnect between official ceremonies and the brutal experience of death on the front lines, lamenting the silenced lives and the hollow memorials.

English

GLOSSARY

Caesura – Punctuation in the middle of a line
Tone – A writer's attitude
Mood – Emotions that the reader feels while reading
Ambiguity – Not clear in meaning
Figurative language – Proper name for images such as metaphors
Quatrain – A stanza that has four lines
Couplet – A pair of successive lines of verse
Iambic Pentameter – A line of five iambs in poetry (ten syllables)
Iambic Tetrameter – Four iambs in a line of poetry
Allegory – A story that express a deeper meaning or a hidden idea
Motif – A recurring pattern or an idea that repeats in the story to reinforce the theme
Symbolism – An image, object, idea, or symbol is used to represent something other than its literal meaning
Imagery - Appealing to a readers' senses to create an image or idea in their head

Simile – comparison using 'like' or 'as'
Metaphor – comparison saying one thing is another
Stanza – Verses in a poem
Repetition – repeated use of words or phrases to emphasise ideas
Rhyme – words that sound the same
Personification – Giving an object human qualities
Alliteration – Words that start with the same sound
Sibilance – Repetition of words that begin with 's', often to used to create a hissing effect
Assonance – repetition of vowel sounds in words that are close together in a sentence or verse
Enjambment – A line of words in poetry that run onto another line
Extended metaphor – A metaphor that continues for multiple lines
Half–rhyme – When consonant sounds rhyme, but vowel sounds do not e.g. squat/slate
Volta – Turning point or sudden change

This unit is inherently **challenging** and **stretching** as it requires students to begin to make connections across texts. It will build on exploratory analysis to **compare,** and **contrast** ideas and feelings within and across the poems.

"like, similar to, also, unlike, similarly, in the same way, likewise, again, compared to, in contrast, in like manner, contrasted with, on the contrary, however, although, yet, even though, still, but, nevertheless, conversely, at the same time, regardless, despite, while, on the one hand … on the other hand"

French

Each week you will need to practise and learn your **Sentence of the Week** as well as your **Vocabulary of the Week**. For your **Vocabulary of the Week** also pay attention to which

Verbs are in **VIOLET**
Feminine nouns are in **PINK**
Masculine nouns are in **BLUE**
Adjectives are in **AMBER**

Week 5	J'ai un ami amusant. Il est chanteur.	I have a funny friend. He is a Singer.
Week 6	Le professeur est malade et la chanteuse est intelligente.	The teacher is ill and the singer (f) is intelligent.
Week 7	Il fait la cuisine mais elle fait les courses.	He does the cooking but she does the shopping.
Week 8	Je suis amusant comme mon ami.	I am funny, like my friend.
Week 9	Il fait beau et je fais une promenade.	The weather is good and I am going for a walk.

Week 6		Week 7		Week 8		Week 9		Week 10	
l'acteur (m)	actor (m)	faire	to do, make / doing, making	le poème	poem	le bateau	boat, ship	aimer	to like / liking
l'actrice (f)	actor (f)	je fais	I do / make	le poète	poet (m)	le magasin	shop	cocher	to tick / ticking
la fille	girl	tu fais	you do / make	la poète	poet (f)	le promenade	walk, ride	rester	to stay / staying
le garçon	boy	il fait	he does / makes	le ciel	sky	la visite	visit	passer	to spend / spending time
le médecin	doctor (m)	elle fait	she does / makes	le rêve	dream	le voyage	trip, journey	porter	to wear / wearing
la médecin	doctor (f)	ça	that	la vague	wave	le numéro	number	trouver	to find / finding
la personne	person	une activité	an activity	la couleur	colour	la question	question	un uniforme	a uniform
l'anglais (m)	English language	les courses	grocery shopping	bleu(e)	blue	la réponse	answer	l'école (f)	school
le français	French language	la cuisine	cooking	jaune	yellow	beau	beautiful (m)	le moment	moment
le	the (m)	les devoirs	homework	rouge	red	mauvais(e)	bad	la semaine	week
la	the (f)	le lit	bed	vert(e)	green	en	in/by	la solution	solution
les	the (pl)	le ménage	housework	comme	like	de	of	chaque	every
en	in	le modèle	model			Paris	Paris	à	to
le mot	word	Quoi?	What?			Londres	London	avec	with
la phrase	sentence								

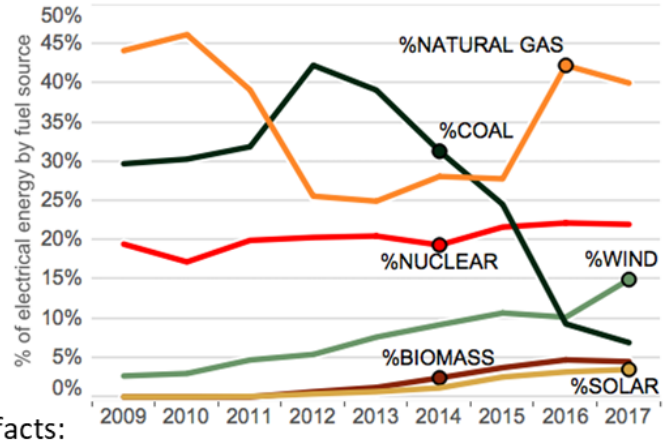
Challenge of Resource Management

Geography

UK Energy Trend

The UK consumes less energy than it did in 1970, despite the population being 9.1 million higher. 12% less energy is used by the average household. Heavy industry uses 60% less energy due to its decline. Demand for energy by transport has increased.

UK's Energy Mix



Key facts:

- 2015 – majority of UK's energy mix = fossil fuels
- Nuclear provides just over 1/5th of the UK's energy mix
- Renewables provide just over 20% of the UK's energy mix
- 2011 coal use increased - older power stations worked to capacity (due to closure - EU regulations on emissions)
- Oil and gas reserves have declined.
- Renewable energies like wind are growing in significance, but are still only a small percentage of energy produced
- Renewables are encouraged to meet targets on reducing emissions

Energy Exploitation Issues Economic vs Environmental

Fossil fuels

- Unsustainable, they will eventually become too expensive or run out.
- Costs increase to deal with the effects of climate change and adaption to it.
- CO_2 is released which contributes to acid rain and climate change.
- Fracking for shale gas can cause earthquakes and groundwater pollution.

Nuclear

- Nuclear plants are expensive to build and decommission.
- Transporting and storing nuclear waste is expensive.
- Waste is radioactive for 100 years+ and has to be stored safely to avoid contamination.
- Nuclear accidents have long-term impacts on people and wildlife.

Renewable energy resources

- High set-up costs. Costs increase in remote areas.
- Biomass can reduce land available for food production increasing food prices.
- Low profitability is a concern.
- Biomass reduces biodiversity as only one crop is grown e.g. sugar cane.
- HEP schemes flood land upstream, changing the landscape and wildlife.
- Wind turbines can affect bird migration.

Option C: Energy Tier 3

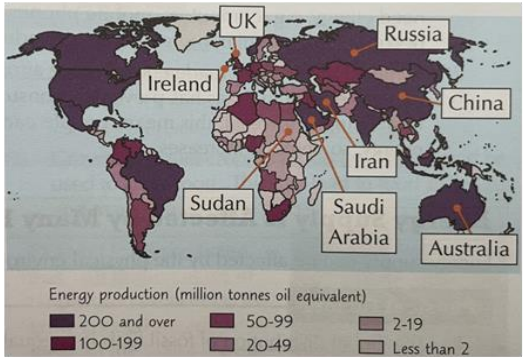
Energy Security – having a reliable, uninterrupted & affordable supply of energy.

Energy Surplus – where a country produces more energy than it's population requires.

Energy Deficit – where a country has less energy than it requires

Energy Insecurity – where a country does not have a reliable & affordable supply of energy, or it is interrupted

Global Energy Production



Total energy produced per country, 2012

Production is unevenly distributed:

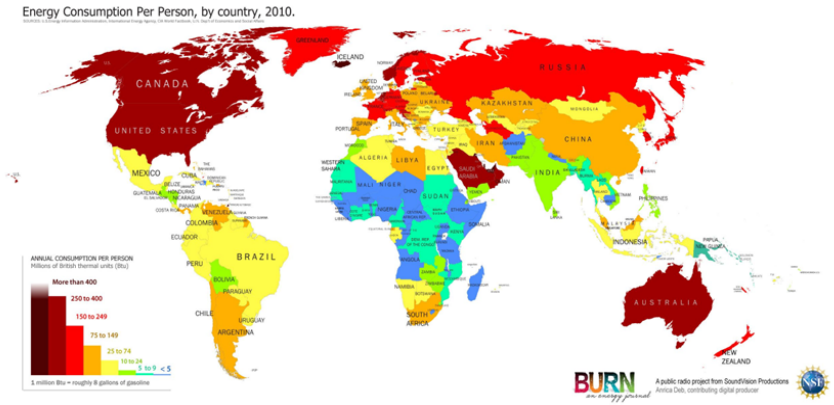
Some countries produce lots of energy due to large energy reserves & money for exploitation (Russia – oil & gas)

Some countries have little energy - few resources or unable to exploit resources due to poverty/ war (Ireland – few resources, Sudan – war & poverty)

Challenge of Resource Management

Geography

Global Energy Consumption



Wealth links to Energy Consumption:
Wealthy = higher consumption due to higher standard of living & because they can afford it – most use energy-intensive devices – e.g. Sweden, USA.
Poorer, less developed = lower consumption as people are less able to afford it, less energy is available & less dependency on energy consumption – e.g. Mongolia.

Reasons for Rising Global Energy Demand

1. Rising Population	2. Economic Development	3. Advances in Technology
- Global population to increase to over 9 billion by 2040 - More people means more energy needed e.g. to heat homes	Recent economic development has increased LIC wealth: - People use wealth to buy more material possessions that use more energy e.g. cars, TVs - As countries develop, industry expands which uses more energy	- Advances have developed new energy powered devices - Some advances have made energy more affordable – Wind energy e.g. in Texas has limited consumer energy costs

Impacts of energy insecurity

Environmental/Economic Costs:
- Fossil fuels are used up, less accessible reserves means more environmentally sensitive areas are exploited
- Higher costs & increased risk of environmental damage

Food Production:
- Insecurity can limit use of agricultural machinery
- Demand for cleaner & cheaper energy – increases biofuel demand
- Growing biofuel

Industrial Output:
- Energy shortages & higher energy costs reduced industrial output – factories produce less or relocate to minimise costs causing job insecurity
- Higher costs often passed to the consumer

Potential for Conflict:
- Potential for political instability when demand exceeds supply
- Causes conflict between countries with an energy surplus & those with a deficit e.g. South Sudan vs Sudan conflict due to ownership of Heglig oil field resulted in a short war

Increasing Energy Supply

Biomass
Energy produced from organic matter

Wind
Turbines on land or at sea generate electricity

Hydro (HEP)
Largescale dams or micro dams turn turbines

Tidal
Turbines within barrages across river estuaries

Geothermal
Water heated underground in contact with hot rocks produces steam

Wave
Waves force air into a chamber which turns a turbine

Solar
Photovoltaic cells convert sunlight into electricity

Challenge of Resource Management

Geography

Factors Affecting Global Energy Supply

Physical Factors:
- Global distribution is uneven, therefore geographically some countries have energy, some do not
- Location of fossil fuel reserves affects cost and ease of extraction
- Areas climate of geography determines potential to generate renewable energy e.g. solar or wind power

Technological Factors:
- Advances in technology means its more possible to exploit new resources (fracking to reach gas)
- Some technology makes it easier to exploit existing resources e.g. autonomous machines to extract in risky or hard to reach areas
- Technology can safeguard transport of existing resources e.g. earthquake proof gas pipelines from Alaska to the USA

Economic Factors:
- Remaining non-renewable resources costly to extract
- LICs may have potential energy resources but are too poor to exploit them
- Building new energy infrastructure (nuclear power stations, wind farms) can be expensive – e.g. Hinkley Point C £23 billion

Political Factors:
- Political instability in countries with large reserves can limit ability to export – Middle East instability has encouraged countries to seek oil elsewhere
- Climate Change has led to international agreements to reduce concentration of greenhouse gases e.g. Paris Agreement – countries pledged to reduce CO2
- German government plans to phase out nuclear power stations by 2022

Natural Gas Tier 3 Vocab

Fossil fuel - A natural fuel formed in the geological past from the remains of living organisms, such as coal or natural gas.

Shale gas - A form of natural gas (mostly methane), found underground in shale rock.

Carbon emissions - Carbon compound (such as carbon dioxide) released into the atmosphere, often through human activity such as the burning of fossil fuels such as coal or gas.

Advantages

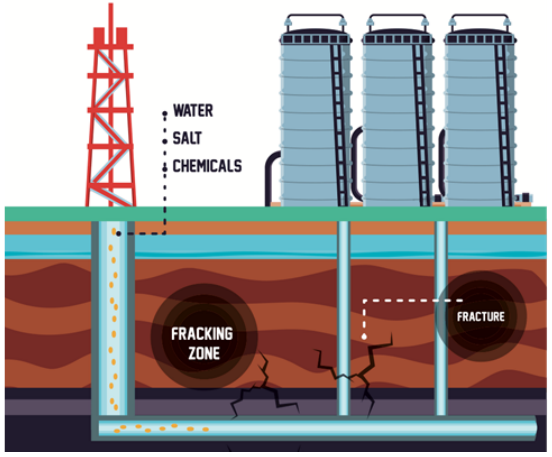
- Natural gas is one of the cleanest fossil fuels, releasing 45% fewer carbon emissions than coal and oil.
- It does not produce waste products, such as coal ash.
- If there is a gas leak, it disappears quickly into the air, whereas oil leaks have a devastating impact on the environment and are expensive to clean.
- Gas can be easily transported through pipelines directly to industry and residential properties.
- There are considerable reserves of gas around the world.
- Gas can be used for both heating and cooking.

Disadvantages

- Gas is highly flammable, which means leaks can result in explosions.
- Natural gas is toxic.
- Gas infrastructure is expensive; pipelines cost a significant amount of money to construct.
- Unless an odorant is added to the gas, leaks can go undetected.
- The controversial process of fracking has caused earthquakes.
- Burning natural gas results in the release of greenhouse gases, particularly carbon dioxide.

Fracking

Recently, shale gas has been extracted using controversial fracking techniques. Fracking involves injecting bedrock with water and chemicals to extract gas.



Challenge of Resource Management

Geography

Chambamontera Micro-Hydro Scheme

Hydro-electric power – Electricity generated by turbines that are driven by moving water.

Micro-hydro scheme – A small-scale hydroelectric scheme that generates between 5 kW and 100 kW of electricity.

Renewable energy source – A resource which is not diminished when it is used; it recurs and cannot be exhausted, such as wind and tidal energy.

Sustainable energy supply – Energy that can potentially be used well into the future without harming future generations.

Where is Chambamontera?

Chambamontera is a remote community in Peru in the Andes Mountains. Its closest town is Jaén.

Why was the scheme needed?

The community of Chambamontera required a sustainable energy scheme because most of its inhabitants relied on subsistence farming, small-scale coffee production, and livestock rearing.

The lack of electricity has significantly hindered development, as it is essential for heating, lighting, and powering homes and businesses.

Despite efficient farming practices, poverty was widespread, with nearly half of the population living on just US$2 a day.

The area's challenging terrain, with steep slopes at altitudes up to 1700 meters and roads often closed in winter, contributes to its isolation and the economic impracticality of constructing a traditional electricity grid.

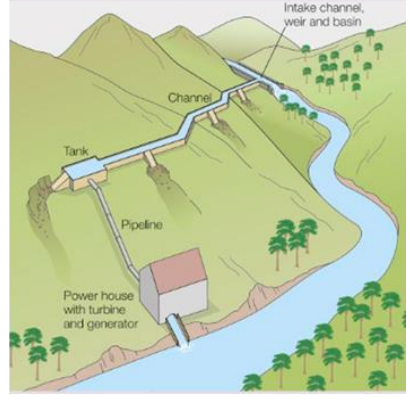
Main features

To address the energy shortage, Chambamontera implemented a micro-hydro scheme with the help of the charity Practical Action.
The region's high rainfall, steep terrain, and fast-flowing rivers make it well-suited to harnessing water power as a sustainable energy source.
The project's total cost was US$51,000, with funding from the government, investments from Japan, and contributions from the local community. Each family faced an average cost of US$750, with credit options available to assist with payments.

Benefits of the scheme

The advantages of the scheme include:

- Business growth, as access to piped water has enabled the use of machinery for coffee processing.
- Reduced risk of fires since there is no longer a need for kerosene lighting.
- Improved educational opportunities by enabling students to study after dark due to improved school facilities.
- Strengthened healthcare services through the refrigeration of medicines.
- Promoting safer night-time mobility with the installation of streetlights.
- A reduction in rural-to-urban migration.
- Reduced flood risks by regulating river flow.
- Decreased reliance on wood as a heating source helping to prevent deforestation and soil erosion.
- A project lifespan of at least 25 years.
- Consistent electricity during winter months when the demand for heating is greater.
- A dependable power supply for refrigeration, lighting, computer use, and entertainment.



Deduction

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What do I need to be able to do?

By the end of this unit you should be able to:

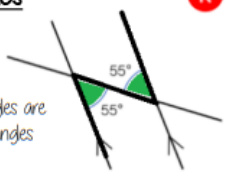
- Identify angles in parallel lines
- Solve angle problems
- Make conjectures with angles
- Make conjectures with shapes

Keywords

Parallel: two straight lines that never meet with the same gradient
Perpendicular: two straight lines that meet at 90°
Transversal: a line that crosses at least two other lines
Sum: the result of adding two or more numbers
Conjecture: a statement that might be true but is not proven
Equation: a statement that says two things are equal
Polygon: a 2D shape made from straight edges
Counterexample: an example that disproves a statement

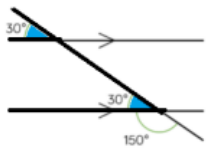
Alternate angles (R)

Because alternate angles are equal the highlighted angles are the same size

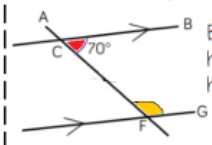


Corresponding angles (R)

Because corresponding angles are equal the highlighted angles are the same size



Co-interior angles (R)



Because co-interior angles have a sum of 180° the highlighted angle is 110°

As angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

Solving angle problems

Angles on a straight Line
180°

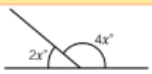
Vertically opposite angles
Equal

Angles around a point
360 °

Triangles
Sum of angles is 180 °

Isosceles have the same base angles

Link angle facts to algebra



Form an equation

$$2x + 4x = 180°$$

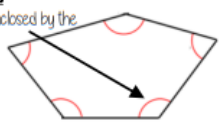
State the reason

The sum of angles on a straight line is 180 °

Solve

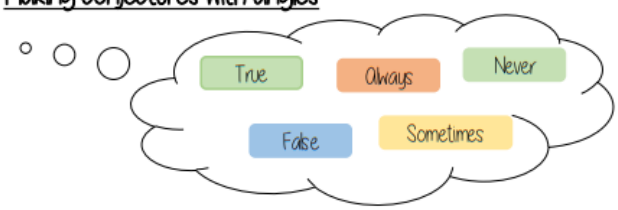
$$2x + 4x = 180°$$
$$6x = 180°$$
$$x = 30°$$

Interior Angles
The angles enclosed by the polygon



(number of sides – 2) x 180

Making conjectures with angles



Proving a conjecture
A pattern is noticed for many cases

Disproving a conjecture
Only one counterexample is needed to disprove a conjecture

Apply the angle rules

The sum of angles in a triangle is 180°

Test the theory

$180 - 70 - 20 = 90$
$180 - 85 - 5 = 90$
$180 - 45 - 45 = 90$

Make conjecture

The angle that meets the circumference in a semi circle is 90°

Making conjectures with shapes

Keywords and facts to recall with shape

Area: the amount of space inside a shape
Perimeter: the length around a shape
Regular Polygons: All sides and angles are equal

Quadrilateral Facts

Square
All sides equal size
All angles 90°
Opposite sides are parallel

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

Maths

Rotation & Translation

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What do I need to be able to do?

By the end of this unit you should be able to:

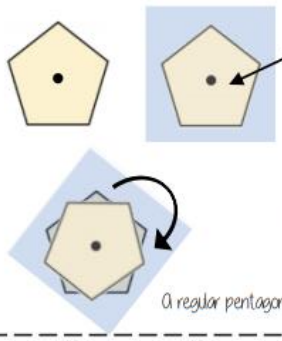
- Identify the order of rotational symmetry
- Rotate a shape about a point on the shape
- Rotate a shape about a point not on a shape
- Translate by a given vector
- Compare rotations and reflections

Keywords

Rotate: a rotation is a circular movement
Symmetry: when two or more parts are identical after a transformation
Regular: a regular shape has angles and sides of equal lengths
Invariant: a point that does not move after a transformation
Vertex: a point two edges meet
Horizontal: from side to side
Vertical: from up to down

Rotational Symmetry

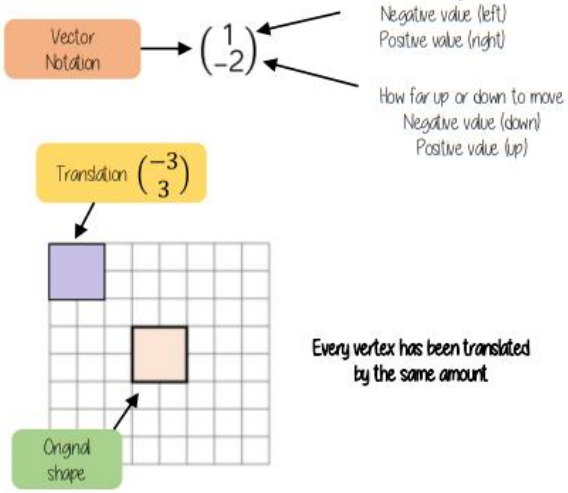
Tracing paper helps check rotational symmetry



1. Trace your shape (mark the centre point)
2. Rotate your tracing paper on top of the original through 360°
3. Count the times it fits back into itself

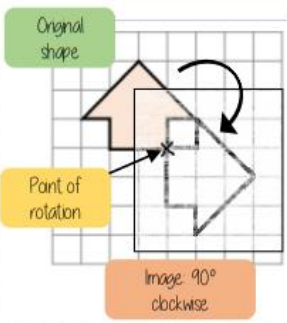
A regular pentagon has rotational symmetry of order 5

Translation and vector notation



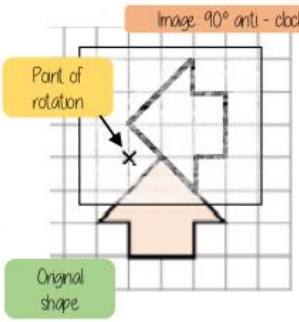
Every vertex has been translated by the same amount

Rotate from a point (in a shape)



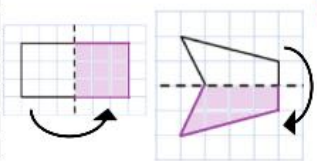
1. Trace the original shape (mark the point of rotation)
2. Keep the point in the same place and turn the tracing paper
3. Draw the new shape

Rotate from a point (outside a shape)



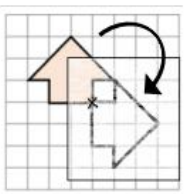
1. Trace the original shape (mark the point of rotation)
2. Keep the point in the same place and turn the tracing paper
3. Draw the new shape

Compare rotations and reflections



R Reflections are a mirror image of the original shape

Information needed to perform a reflection:
- Line of reflection (Mirror line)



Rotations are the movement of a shape in a circular motion

Information needed to perform a rotation:
- Point of rotation
- Direction of rotation
- Degrees of rotation

Maths

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Pythagoras' theorem

What do I need to be able to do?

By the end of this unit you should be able to:

- Use square and cube roots
- Identify the hypotenuse
- Calculate the hypotenuse
- Find a missing side in a Right angled triangle
- Use Pythagoras' theorem on axes
- Explore proofs of Pythagoras' theorem

Keywords

Square number: the output of a number multiplied by itself
Square root: a value that can be multiplied by itself to give a square number
Hypotenuse: the largest side on a right angled triangle. Always opposite the right angle.
Opposite: the side opposite the angle of interest
Adjacent: the side next to the angle of interest

Squares and square roots (R)

This can also be written as 6^2

$\sqrt{\ }$ is the square root symbol

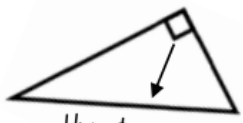
e.g $\sqrt{64} = 8$

Because $8 \times 8 = 64$

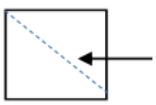
1 × 1	2 × 2	3 × 3	4 × 4	5 × 5	6 × 6	7 × 7	8 × 8	9 × 9	10 × 10
1	4	9	16	25	36	49	64	81	100

Square numbers

Identify the hypotenuse

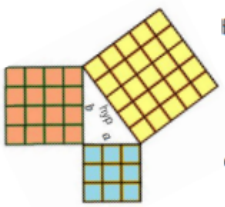


The hypotenuse is always the longest side on a triangle because it is opposite the biggest angle.



Polygons can still have a hypotenuse if it is split up into triangles and opposite a right angle

Determine if a triangle is right-angled



a = 3 b = 4 c = 5

If a triangle is right-angled, the sum of the squares of the shorter sides will equal the square of the hypotenuse

$$a^2 + b^2 = \text{hypotenuse}^2$$

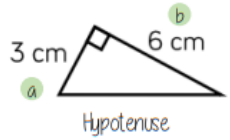
e.g $a^2 + b^2 = hypotenuse^2$

$3^2 + 4^2 = 5^2$

$9 + 16 = 25$

Substituting the numbers into the theorem shows that this is a right-angled triangle

Calculate the hypotenuse



Either of the short sides can be labelled a or b

$$a^2 + b^2 = \text{hypotenuse}^2$$

1 Substitute in the values for a and b

$3^2 + 6^2 = \text{hypotenuse}^2$

$9 + 36 = \text{hypotenuse}^2$

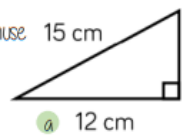
$45 = \text{hypotenuse}^2$

2 To find the hypotenuse square root the sum of the squares of the shorter sides

$\sqrt{45} = \text{hypotenuse}$

$6.71cm = \text{hypotenuse}$

Calculate missing sides



Either of the short sides can be labelled a or b

$$a^2 + b^2 = \text{hypotenuse}^2$$

$12^2 + b^2 = 15^2$

1 Substitute in the values you are given

$144 + b^2 = 225$

$-144 \quad -144$

Rearrange the equation by subtracting the shorter square from the hypotenuse squared

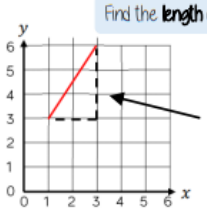
Square root to find the length of the side

$b^2 = 111$

$b = \sqrt{111} = 10.54\ cm$

Pythagoras' theorem on a coordinate axis

Find the **length** of the line segment



The segment can be made into a right-angled triangle by adding the sides on the diagram

The line segment is the **hypotenuse**

$$a^2 + b^2 = \text{hypotenuse}^2$$

The lengths of a and b are the sides of the triangle

Be careful to check the scale on the axes

Maths

Music

Year 9 Music Term 4

Year 9: Rock'n'Roll – Part 2

Composing and performing a piece

Practice your bass line on your phone app or keyboard.

C Chord Triads	C	+	E	+	G	+	E	+
	C	+	E	+	G	+	E	+
F Chord Triads	F	+	A	+	C	+	A	+
	F	+	A	+	C	+	A	+
G Chord Triads	G	+	B	+	D	+	B	+
	G	+	B	+	D	+	B	+

3 styles – Walking (single notes) Swing doubles (play twice with swing rhythm) and Walking with swing (country style)

Challenge: Use full arpeggio

C	+	E	+	G	+	A	+
Bb	+	A	+	G	+	E	+

Applying the blues progression

Rock'n'Roll has the same chord structure as the blues.

Practice your bass line with the full blues chord structure.

12-Bar Blues Structure – Counting to know where you are.

I (C)	I (C)	I (C)	I (C)
1,2,3,4	2,2,3,4	3,2,3,4	4,2,3,4
IV (F)	IV (F)	I (C)	I (C)
1,2,3,4	2,2,3,4	3,2,3,4	4,2,3,4
V (G)	IV (F)	I (C)	V (G)
1,2,3,4	2,2,3,4	3,2,3,4	4,2,3,4

Challenge: Use full arpeggio with syncopation.

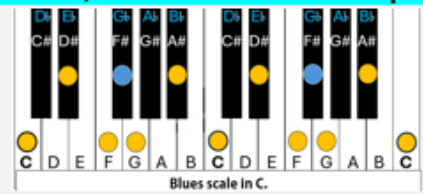
C	$C_{(8ve)}$	E	$C_{(8ve)}$	G	$C_{(8ve)}$	A	$C_{(8ve)}$
Bb	$C_{(8ve)}$	A	$C_{(8ve)}$	G	$C_{(8ve)}$	E	$C_{(8ve)}$

Applying lead parts

Try recording your bass-line as audio to your phone so you can play it back to play lead riffs on top of it.

Unlike the blues, rock'n'roll lead parts are more energetic and livelier than the blues' which is typically sad and soulful.

Create some rock'n'roll riffs from the blues scale, but make them sound upbeat.



Creating Rock'n'Roll lyrics

Rock'n'roll lyric characteristics -

Rock'n'roll lyrics are also more positive and celebratory than the typical blues' lyrics, which are more downbeat.

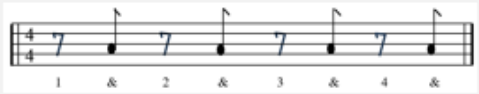
Typical subjects:
Romance/crushes
Character stories →
Cars and Freedom
School & teenage life

Write lyrics for your rock'n'roll song that fits the 12 bars structure.
Challenge: Sing them.

Year 9: Off beat/Syncopation

If the rhythm always sits on the main beats, it can sound heavy, drudging and dull –
To give it a lift, many styles of music use off-beats (syncopation) to lift the music and give it a groove you can dance to.

One of the most famous examples is Reggae from Jamaica with its heavy bass and choppy bright guitar on the off-beats.

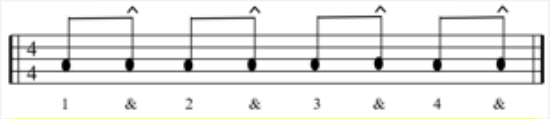


Play the rhythm by saying the count and clapping or tapping on the 'ands'.
Challenge: Also tap your foot on the main beats.

Weak and strong beats

For a more subtle flowing groove, instead of playing rhythm like a switch (either the note is played or it is not) we can create a syncopated feel by stressing some beats and playing others quieter.

Play the rhythm below – but make the notes with little up arrows (accents) louder, and the others quieter.



Challenge: Make up your own rhythm with accents.

PE

Year 9 Physical Education Term 4

7 Serve and Rally Play

Learn the **underarm and overarm serve**. Keep the ball in play by working as a team—**3 touches per side** (dig-set-spike) is the ideal sequence.

Volleyball

8 Key Rules

Volleyball is played **6 vs 6** (indoors) Teams rotate **clockwise** each time they win a point on their opponent's serve.

A player **cannot hit the ball twice in a row**.

Key rules include: **no catching, lifting, or throwing the ball, no net touches,** and **no crossing the centre line.**

Volleyball

9 Lateral Pass

A **lateral pass** (also known as a sideways or backward pass) is the basic passing technique in rugby. Players are **not allowed to pass the ball forward**—it must go **sideways or backwards** to a teammate.

Rugby

10 Tackling or Tagging

In **tag rugby**, remove the tag cleanly and hold it up. In **contact rugby**, tackle safely by lowering your height and wrapping your arms around the legs. Always **keep your head to the side** and follow the safety rules.

Rugby

11 Rucking & Support Play

After a tackle, players must **release the ball**. Teammates form a **ruck** over the ball to retain possession. Support players should run close to provide **passing options** and recycle the ball quickly.

Rugby

12 Offside Rule in Rugby

A key rule is Offside:

A player is **offside** in rugby if they are **in front of the ball** or in front of the teammate who last played the ball. Being offside means you are **not allowed to interfere with play**—you can't tackle, block, or try to win the ball.

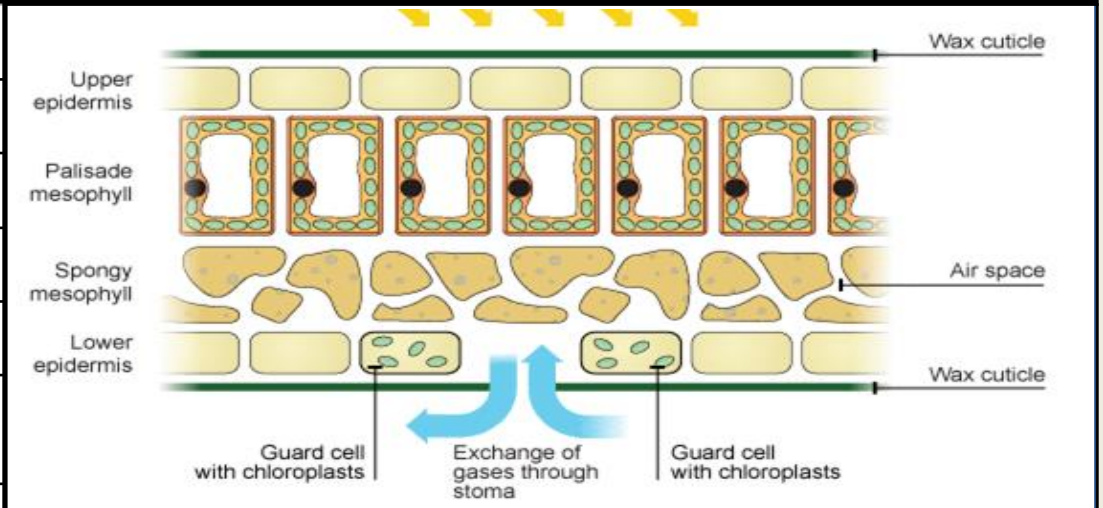
Rugby

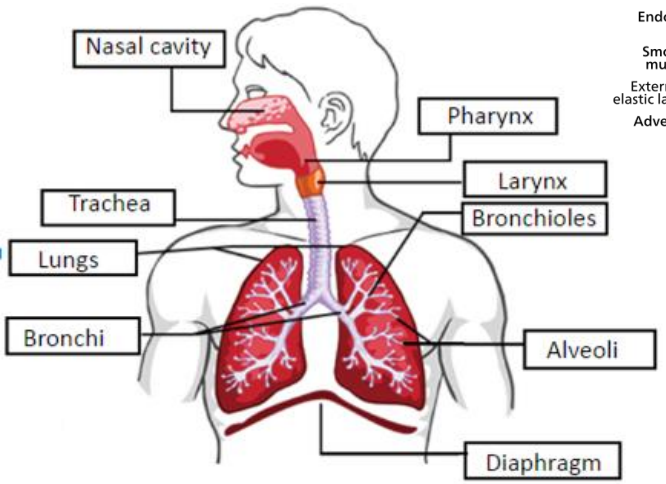
Biology

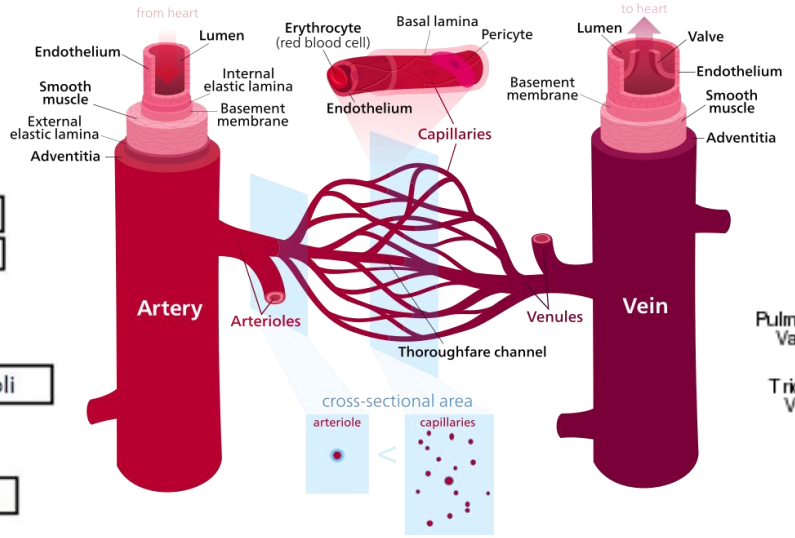
B2 Organising Plants and Animals

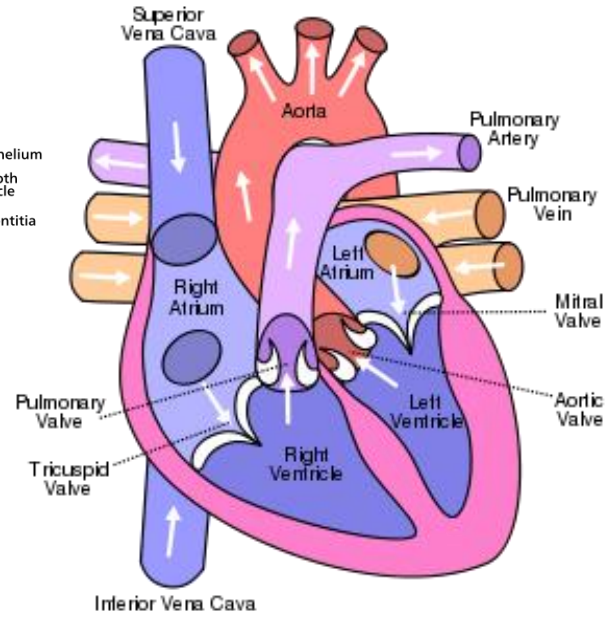
Keywords	
Arteries	Blood vessels that carry blood away from the heart.
Veins	Blood vessels that carry blood to the heart.
Capillaries	The smallest blood vessels where exchange occurs.
Xylem	Transports water around the plant.
Phloem	Carries dissolved sugars around the plant.
Translocation	The movement of sugars from the leaves to the rest of the plant through the phloem.
Transpiration	The loss of water vapour from the leaves of plants through the stomata.

Cross section of a leaf









Chemistry

C4 Chemical Changes

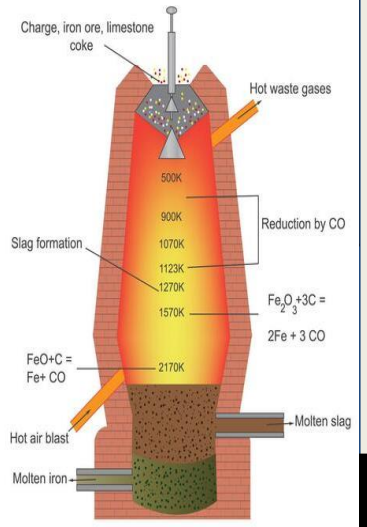
Keywords

Ion	The charged particle formed when an atoms gains or loses electrons
Displacement Reaction	When a more reactive substance takes the place of a less reactive substance
Oxidation	The gaining of oxygen OR the loss of electrons (OIL)
Reduction	The loss of oxygen OR the gain of electrons (RIG)
Base	Ionic compounds that can neutralise acids
Alkali	Soluble bases

Extracting Metals

Least reactive metals occur native. More reactive metals occur as ores.
For ores containing metals less reactive than carbon, carbon can be used to reduce the metal in a displacement reaction.
Example:
Iron (III) oxide + carbon → Iron + carbon dioxide

Some less reactive metals can be reduced using hydrogen:
Copper (II) oxide + hydrogen → copper + water



Common Salts

Hydrochloric acid (HCl) → chlorides (Cl^-)
Sulphuric acid (H_2SO_4) → sulphates (SO_4^{2-})
Nitric acid (HNO_3) → nitrates (NO_3^-)

General Word Equations

Metal + oxygen → Metal oxide
Metal + water → Metal hydroxide + hydrogen
Metal + acid → Metal salt + hydrogen
Acid + base → Salt + water
Acid + alkali → Salt + water
Acid + carbonate → Salt + water + carbon dioxide

Charges on +ve ions	Charges on -ve ions
Group 1 metals = +1 Ammonium (NH_4^+) = +1 Group 2 metals = +2 Aluminium = +3 Transition metals can vary	Group 7 = -1 Nitrate (NO_3^-) = -1 Hydroxide (OH^-) = -1 Sulphate (SO_4^{2-}) = -2 Carbonate(CO_3^{2-}) = -2 Oxide (O^{2-}) = -2

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum	least reactive	Pt

Ionic and Half Equations

Step 1: Write a balanced symbol equation:
$Mg_{(s)} + CuSO_{4(aq)} \rightarrow MgSO_{4(aq)} + Cu_{(s)}$

Step 2: Separate the ions:
$Mg_{(s)} + Cu^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} + Cu_{(s)}$

Step 3: Delete the species that appear exactly the same on both sides:
$Mg_{(s)} + Cu^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Cu_{(s)}$

Half equations:
$Mg_{(s)} \rightarrow Mg^{2+}_{(aq)} + 2e^-$ $\quad\quad$ $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$

State symbols: (s) = solid, (l) = liquid, (g) = gas, (aq) = aqueous

Chemistry

C7 - Crude Oil

Keywords

Hydrocarbon	A compound made of only hydrogen and carbon atoms.
Fractional Distillation	Separating a liquid mixture into fractions differing in boiling point by distillation.
Fuel	Any substance that releases energy when burned.
Cracking	The process by which complex, long chain hydrocarbons are broken down into smaller, simpler ones.
Alkane	A saturated hydrocarbon.
Alkene	An unsaturated hydrocarbon that contains a double bond.
Complete Combustion	When a fuel is burnt in a plentiful supply of oxygen.
Incomplete Combustion	When a fuel is burnt in a limited supply of oxygen.
Condensing	When a gas cools and turns into a liquid.

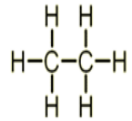
Alkanes

Saturated hydrocarbons

Do not contain a double bond.

General formula C_nH_{2n+2}

Ethane C_2H_6



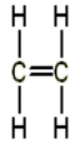
Alkenes

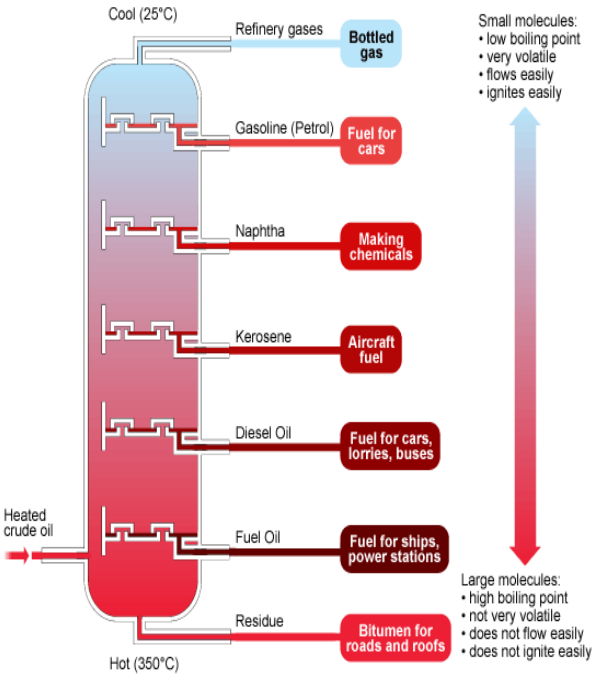
Unsaturated hydrocarbons.

Contain a double bond

General formula C_nH_{2n}

Ethene C_2H_4





Cracking

Cracking is the process of breaking down large hydrocarbons into smaller ones. It uses either a catalyst or steam to make the hydrocarbons thermally decompose. Alkanes and alkenes are the products of cracking.

For example, decane can be broken down with a catalyst at 500^{O}C to make pentane which can be used in petrol

Decane → Pentane + Propene + Ethene

$C_{10}H_{22} \rightarrow C_5H_{12} + C_3H_6 + C_2H_4$

Fractional Distillation

Crude oil is a mixture of different alkanes. Each compound has a different boiling points.

⇩

To separate crude oil, it is heated, vapourised and passed through a fractionating column.

⇩

In this column, the hydrocarbons cool and condense at different points depending on their boiling points.

⇩

Short chain hydrocarbons condense at the top where it is cool and long chain hydrocarbons condense at the bottom where it is hot.

⇩

The mixtures taken out of the column are called fractions

Combustion

During combustion, hydrogen and carbon atoms in fuels are oxidised. There are two types.

Complete Combustion:

hydrocarbon + oxygen → carbon dioxide + water

Incomplete Combustion:

hydrocarbon + oxygen → carbon + water + carbon monoxide